

## PATENT ABSTRACTS OF JAPAN

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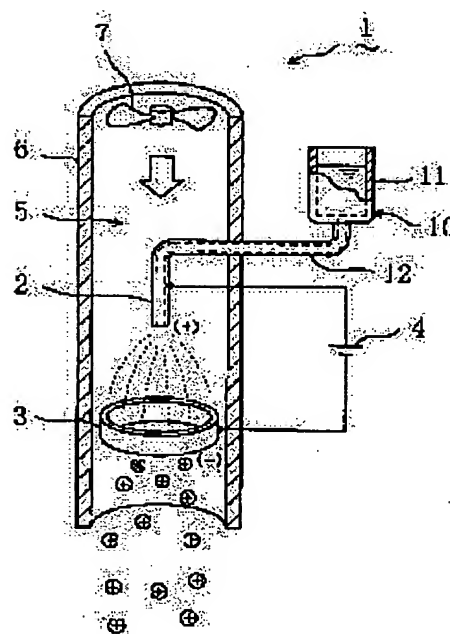
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## (54) ION GENERATOR

(57)Abstract:

**PROBLEM TO BE SOLVED:** To widen the utilization range of an ion generator (1), to heighten the effect of electrification neutralization of the same, and to heighten the operation efficiency of the same, by increasing the volume of ion generated by the ion generator (1).

**SOLUTION:** The ion generator comprises a discharge electrode (2), an opposite electrode (3) arranged opposite to the discharge electrode (2) with a prescribed distance, a high voltage power source 4 connected to both electrodes (2, 3). Water molecule is electrified by supplying fine water drops between the discharge electrode (2) and the opposite electrode (3).



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## CLAIMS

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[Claim(s)]

[Claim 1] Discharge electrode (2) This discharge electrode (2) Counterelectrode which received, detached predetermined spacing and was arranged (3) Two electrodes (2 3) Connected high voltage power supply (4) It is the ion generator which it had and is a discharge electrode (2). Counterelectrode (3) Ion generator equipped with a waterdrop supply means (10, 20, 30) to supply waterdrop in between.

[Claim 2] Discharge electrode (2) Counterelectrode (3) Ion generator [ equipped with an ionization means (10, 20, 30) to supply the source material of a small ion in between, and to combine this source material with the electrified water molecule ] according to claim 1.

[Claim 3] A waterdrop supply means (10) is a counterelectrode (3). It has the water pipe (12) at which waterdrop is made dropped from the upper part, and the point of this water pipe (12) is a discharge electrode (2). While being constituted, it is a discharge electrode (2). It is a counterelectrode (3) to a lower part. Ion generator according to claim 1 or 2 arranged.

[Claim 4] Discharge electrode (2) A side to counterelectrode (3) A ventilation means to ventilate toward a side (7) Ion generator according to claim 3 which it has.

[Claim 5] A waterdrop supply means (20) is a discharge electrode (2) about the steam generated by heating means (23) to heat water and to evaporate it, and the heating means (23). Counterelectrode (3) Ion generator [ equipped with a steam installation means (7 26) to introduce in between ] according to claim 1 or 2.

[Claim 6] Discharge electrode (2) It is a counterelectrode (3) to a lower part. It is arranged and a steam installation means (7 26) is a discharge electrode (2) about a steam. Introductory tubing (26) introduced up and a ventilation means to circulate a steam below (7) Ion generator according to claim 5 which it has.

[Claim 7] A waterdrop supply means (30) is equipped with the discharge nozzle (32) which sprays water, and this discharge nozzle (32) is a discharge electrode (2). Ion generator according to claim 1 or 2 constituted.

[Claim 8] It is a counterelectrode (3) to the lower part of a discharge nozzle (32). It is arranged and is a counterelectrode (3) from a discharge nozzle (32) side. A ventilation means to ventilate toward a side (7) Ion generator according to claim 7 which it has.

[Claim 9] A waterdrop supply means (30) is equipped with the discharge nozzle (32)

which sprays water, and is a discharge electrode (2). A discharge nozzle (32) and counterelectrode (3) Ion generator according to claim 1 or 2 which is in between and is arranged near the discharge nozzle (32).

[Claim 10] Discharge electrode (2) It is a counterelectrode (3) to a lower part. It is constituted so that a discharge nozzle (32) may spray water below, while being arranged, and it is a counterelectrode (3) from a discharge nozzle (32) side. A ventilation means to ventilate toward a side (7) Ion generator according to claim 9 which it has.

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] Especially this invention relates to the ion generator made to generate ion in air by using water as a raw material about an ion generator.

[0002]

[Description of the Prior Art] Before, electrification neutralization of the fine particles in electrification neutralization and fine-particles transportation of the air in the clean room in semiconductor industry etc., and recently, the ion generator is used for various applications, such as anion supply to the interior of a room.

[0003] There is a thing using corona discharge in an ion generator as indicated by JP,11-191478,A. Moreover, as an ion generator of other types, in case water is mechanically divided in detailed waterdrop, some which generate an anion are in neighboring air.

[0004]

[Problem(s) to be Solved by the Invention] However, by the ion generator using corona discharge, the generated amount of ion was measured, and it converted into the current, and did not pass over this to only  $1 / 100,000 - 1/1$  million as compared with the supply discharge current, but there was a problem with very few amounts of ion generated considering the supply discharge current. Moreover, there were few amounts of ion actually generated also by the ion generator of the type divided in detailed waterdrop in water, and a lot of water for generating sufficient quantity of ion was required for them.

[0005] Thus, since it was not easy to generate a lot of ion by the conventional ion generator, it was difficult to acquire effectiveness sufficient also for the application of electrification neutralization.

[0006] Moreover, since there were few ion yields, the point of the conventional ion generator that applicability was narrow was also a problem. for example, the amount which will be electrified in dust if there are few ion yields although it is possible to apply an ion generator to the dust collector which the dust in air is electrified and carries out uptake -- not decreasing -- it will not obtain but utilization will become difficult.

[0007] Furthermore, if it was going to generate the ion of amount sufficient by the conventional ion generator, since the consumption of power or water would become great, it was also difficult to desire efficient operation.

[0008] This invention is being originated in view of such a trouble, the place made into the purpose being increasing the ion yield in an ion generator, heightening effectiveness, such as electrification neutralization, while extending applicability, and also raising operation effectiveness.

[0009]

[Means for Solving the Problem] Discharging in air, by supplying detailed waterdrop, this invention electrifies this waterdrop and is ionized.

[0010] Concretely, the 1st solution means which this invention devised is a discharge electrode (2). This discharge electrode (2) Counterelectrode which received, detached predetermined spacing and was arranged (3) Two electrodes (2 3) Connected high voltage power supply (4) Ion generator which it had (1) It is considering as the premise. And this ion generator (1) Discharge electrode (2) Counterelectrode (3) It has a waterdrop supply means (10, 20, 30) to supply waterdrop in between.

[0011] It sets in the above-mentioned configuration and is a discharge electrode (2). Counterelectrode (3) Corona discharge arises by impressing the high voltage. And discharge electrode (2) Counterelectrode (3) If detailed waterdrop is supplied with a waterdrop supply means (10, 20, 30) in between, the waterdrop will charge and ionize. It changes to the small ion with a more long life to which the minimum ion with a plus charge or a minus charge is generated, and this minimum ion combines with the molecule of water, and specifically uses the cluster of a water molecule as a nucleus by corona discharge. In this configuration, the amount of ion to generate can be adjusted from applied voltage and amount of water.

[0012] Moreover, it sets for the solution means of the above 1st, and the 2nd solution means which this invention devised is a discharge electrode (2). Counterelectrode (3) The source material of a small ion is supplied in between, and it considers as the configuration equipped with an ionization means (10, 20, 30) to

combine this source material with the electrified water molecule. In addition, if the source material of a small ion is mixed into the above-mentioned waterdrop, a waterdrop supply means (10, 20, 30) and an ionization means (10, 20, 30) can be made to serve a double purpose.

[0013] Thus, when constituted, it is a discharge electrode (2). Counterelectrode (3) The source material of small ions, such as ammonia, is supplied in between. Therefore, the cluster ion with which the water molecule was generated by becoming a nucleus combines with ammonia etc., and the long lasting [ more ] and stabilized small ion is generated.

[0014] Moreover, for the 3rd solution means which this invention devised, it sets for the above 1st or the 2nd solution means, and a waterdrop supply means (10) is a counterelectrode (3). It has the water pipe (12) at which waterdrop is made dropped from the upper part, and is a discharge electrode (2) about the point of this water pipe (12). While constituting, it is a discharge electrode (2). It is a counterelectrode (3) to a lower part. It arranges.

[0015] Thus, when constituted, it is a discharge electrode (2). Counterelectrode (3) When an electrical potential difference is impressed, they are waterdrop and a counterelectrode (3) in fact. It discharges in between. and water pipe (2) from — according to an operation of discharge by the high voltage, the dropped waterdrop turns into detailed waterdrop and dispels. That is, waterdrop will receive an operation of electrostatic atomization. And this detailed waterdrop charges and ionizes in response to an operation of discharge.

[0016] Moreover, it sets for the solution means of the above 3rd, and the 4th solution means which this invention devised is a discharge electrode (2). A side to counterelectrode (3) A ventilation means to ventilate toward a side (7) It prepares.

[0017] Thus, if constituted, air will flow in the same direction as the direction which waterdrop trickles from the lower limit of a water pipe (12). For this reason, the air containing the ionized water molecule will be sent out one by one in the same direction as the dropping direction of waterdrop.

[0018] Moreover, the 5th solution means which this invention devised is a discharge electrode (2) about the steam generated by heating means (23) to heat water and to evaporate it as a waterdrop supply means (20) in the above 1st or the 2nd solution means, and the heating means (23). Counterelectrode (3) A steam installation means (7 26) to introduce in between is established.

[0019] Thus, if constituted, a steam will be generated by water being heated by the heating means (23). And this steam is a discharge electrode (2). Counterelectrode

(3) If introduced in between, the detailed waterdrop contained in the steam will charge and ionize, and the cluster ion which uses a water molecule as a nucleus will be generated.

[0020] Moreover, it sets for the solution means of the above 5th, and the 6th solution means which this invention devised is a discharge electrode (2). It is a counterelectrode (3) to a lower part. It arranges and is a discharge electrode (2) about a steam in a steam installation means (7 26). Introductory tubing (26) introduced up and a ventilation means to circulate this steam below (7) It is made the configuration which it had.

[0021] Thus, when constituted, a steam is a discharge electrode (2) by introductory tubing (26). After being introduced up, it is a discharge electrode (2). Counterelectrode (3) It shows around in between. Therefore, the waterdrop contained in this steam charges and ionizes in response to an operation of discharge. And the generated cluster ion is a ventilation means (7). It is sent out with air.

[0022] moreover, the discharge nozzle (32) on which the 7th solution means which this invention devised sprays water as a waterdrop supply means (30) in the above 1st or the 2nd solution means -- preparing -- this discharge nozzle (32) -- discharge electrode (2) \*\*\*\*\* -- it is made to use

[0023] Thus, if constituted, the water sprayed from the discharge nozzle (32) will be charged, and the cluster ion which uses a water molecule as a nucleus will be generated by ionizing in response to an operation of discharge.

[0024] Moreover, it sets for the solution means of the above 7th, and the 8th solution means which this invention devised is a counterelectrode (3) to the lower part of a discharge nozzle (32). It arranges and is a counterelectrode (3) from a discharge nozzle (32) side. A ventilation means to ventilate toward a side (7) It prepares.

[0025] Thus, if constituted, since air will flow in the same direction as the direction on which waterdrop is sprayed, the air containing the ionized water molecule is sent out one by one in the same direction as the spraying direction of waterdrop.

[0026] Moreover, the 9th solution means which this invention devised prepares the discharge nozzle (32) which sprays water as a waterdrop supply means (30) in the above 1st or the 2nd solution means, and is this discharge nozzle (32) and counterelectrode (3) about a discharge electrode (2). It is in between and arranges near the discharge nozzle (32).

[0027] Thus, also when constituted, it is charged in response to an operation of discharge of the water sprayed through the discharge nozzle (32) from the water

pipe (31), and the cluster ion which uses a water molecule as a nucleus is generated by ionizing.

[0028] Moreover, it sets for the solution means of the above 9th, and the 10th solution means which this invention devised is a discharge electrode (2). It is a counterelectrode (3) to a lower part. While arranging, a discharge nozzle (32) is constituted so that water may be sprayed below, and it is a counterelectrode (3) from a discharge nozzle (32) side. A ventilation means to ventilate toward a side (7) It prepares.

[0029] Thus, if constituted, since air will flow in the same direction as the direction on which waterdrop is sprayed, the air containing the ionized water molecule is sent out one by one in the same direction as the spraying direction of waterdrop.

[0030]

[Effect of the Invention] According to the solution means of the above 1st, it is a discharge electrode (2). Counterelectrode (3) Since waterdrop is supplied and he is trying to electrify a water molecule, discharging in between, the amount of generating ion can be adjusted by adjusting applied voltage and amount of water. Therefore, stopping the discharge current and amount of water, it becomes comparatively easy to increase the amount of generating ion, and operation effectiveness's improves. Moreover, since it becomes easy to generate a lot of stable ion, the effectiveness in the case of using it for the application of \*\*\*\*\*-proof etc. can be raised to sufficient level. Furthermore, ion generator since an ion yield increases (1) It also becomes possible to extend applicability.

[0031] Moreover, according to the solution means of the above 2nd, it is a discharge electrode (2). Counterelectrode (3) Since he is trying to supply the source material of a small ion in between, the stable small ion is generated so much and it becomes possible to supply into air.

[0032] moreover -- according to the solution means of the above 3rd -- a waterdrop supply means (10) -- counterelectrode (3) the water pipe (12) at which waterdrop is made dropped from the upper part -- preparing -- the point -- discharge electrode (2) \*\*\*\*\* -- ion generator (1) which ionizes waterdrop while using an operation of electrostatic atomization since it uses It is utilizable. Moreover, since waterdrop will serve as an electrode in fact if electrostatic atomization is used, degradation of a water pipe (12) does not arise.

[0033] Moreover, a heating means according to the solution means of the above 5th to heat water and to evaporate a waterdrop supply means (20) (23), It is a discharge electrode (2) about the generated steam. Counterelectrode (3) A means to generate



steams, such as a humidifier (21), since it is made the configuration equipped with a steam installation means (7 26) to introduce in between is used, and it is an ion generator (1). It is utilizable.

[0034] Moreover, since it is made the configuration equipped with the discharge nozzle (32) which sprays water as a waterdrop supply means (30) according to the above 7th and the 9th solution means, a spray nozzle etc. is used, and it is an ion generator (1). It is utilizable.

[0035] Moreover, according to the above 4th, 6th, 8th, and 10th solution means, it is a discharge electrode (2). A side to counterelectrode (3) A ventilation means to ventilate toward a side (7) Since he is trying to send out the air containing the waterdrop prepared and ionized one by one in the same direction as the dropping direction of waterdrop, a lot of ion can be supplied to a required place, generating ion efficiently. For this reason, the air containing a lot of ion can be used for various applications, such as electrification neutralization and supply to the interior of a room, and it is an ion generator (1). Applicability can be extended more easily.

[0036]

[The gestalt 1 of implementation of invention] Hereafter, the operation gestalt 1 of this invention is explained to a detail based on a drawing.

[0037] Drawing 1 is an ion generator (1) concerning this operation gestalt 1. It is the sectional view showing an operation in an outline structure list. This ion generator (1) It is a discharge electrode (2) so that it may illustrate. This discharge electrode (2) Counterelectrode which received, detached predetermined spacing caudad and was arranged (3) Two electrodes (2 3) Connected high voltage power supply (4) It has. Discharge electrode (2) And counterelectrode (3) Air duct to which air circulates from the upper part to a lower part (5) It is arranged in the interior.

[0038] Air duct (5) Blast pipe prolonged in the vertical direction (6) Partition formation is carried out inside. This blast pipe (6) Outside the water tank (11) is prepared and the water pipe (12) is connected to the inferior surface of tongue of a water tank (11). This water pipe (12) is a blast pipe (6). It is a counterelectrode (3) at the posture in which it is introduced into the interior and a tip serves as facing down. It is arranged up.

[0039] The above-mentioned high voltage power supply (4) One electrode (plus pole) is connected to the point of a water pipe (12). By this, the point of a water pipe (12) is a discharge electrode (2). It is constituted. And counterelectrode (3) It is formed annularly and is a high voltage power supply (4). It connects with the electrode (minus pole) of another side.

[0040] Moreover, the pipe with a small bore is used for the water pipe (12), and it is constituted so that waterdrop may trickle from a tip. Setting in this configuration, a water tank (11) and a water pipe (12) are a discharge electrode (2). Counterelectrode (3) A waterdrop supply means (10) to supply waterdrop in between is constituted. And it is an air duct (5) by this waterdrop supply means (10). It is a counterelectrode (3) in inside. He is trying to make waterdrop dropped from the upper part.

[0041] In addition, components, such as ammonia, are slightly mixed in the water in a water tank (11) as a source material of a small ion. The above-mentioned source material is combined with the water molecule charged in the generate time of ion. And he is trying for a waterdrop supply means (10) to serve as an ionization means by doing in this way.

[0042] This ion generator (1) Air duct (5) It is a discharge electrode (2) inside. As a ventilation means to ventilate toward a counterelectrode (3) side from a side, he is a fan (7). It has. And this fan (7) He goes caudad and is trying to pass air from the upper part.

[0043] - Operation actuation -, next this ion generator (1) Operation actuation is explained.

[0044] This ion generator (1) It is a discharge electrode (2). It is a discharge electrode (2), making waterdrop dropped from the tip of the water pipe (12) as which it serves. Counterelectrode (3) Since he is trying to impress the high voltage, it becomes an electrode, and according to an operation of the corona discharge by the high voltage, the waterdrop dropped from a water pipe (12) turns into detailed waterdrop, and dispels. That is, waterdrop will receive an operation of electrostatic atomization. And this detailed waterdrop charges and ionizes in response to an operation of discharge. In the example of illustration, it is electrified [ of plus ] by detailed waterdrop and countless plus ion is generated.

[0045] Air duct (5) Inside, he is the above-mentioned fan (7). Discharge electrode (2) A side to counterelectrode (3) Air is flowing downward toward the side. That is, air is flowing in the same direction as the direction which waterdrop trickles from the lower limit of a water pipe (12). For this reason, since the generated plus ion is sent out one by one in the fall direction of waterdrop, the air containing a lot of plus ion flows below.

[0046] Thus, the air containing a lot of generated ion (the below-mentioned small ion) is used for various applications, such as electrification neutralization of the fine particles in electrification neutralization and fine-particles transportation of the air

in the clean room in semiconductor industry etc., and anion supply further to the interior of a room.

[0047] Next, the generation process of ion is explained with reference to drawing 2. First, discharge electrode (2) Counterelectrode (3) By discharge of a between, the minimum ion with plus charges, such as  $N_2^+$  and  $O_2^+$ , is generated. When the rate of a certain charged particle is set to  $v$  and electrolysis is set to  $E$ , in the relation expressed with  $v=kE$ , this minimum ion has the relatively large value (mobility) of  $k$ , and is ion which is very easy to move. On the other hand, if the value of mobility  $k$  becomes small, ion is called an intermediate ion and a large ion from a small ion in order, and it will be hard to move it, so that it turns into a large ion.

[0048] As for the minimum ion, the small ion with a magnitude of about 0.001 micrometers which the minimum ion combines with the molecule of water in this operation gestalt, and uses the cluster of a water molecule as a nucleus by itself although a life is very short and is immediately extinguished to nanosecond order which is easy to move is generated.

[0049] What changed to the stable ion which components, such as ammonia, react and has a life for 1 second or more like  $H_3O^+$  or  $NH_4^+$ , the thing which various components in air which is being illustrated adhered further, and changed are contained in this small ion (ion other than the high mass ion of drawing 2).

[0050] This small ion changes the part to the high mass ion (large ion) stabilized further. However, since this large ion has the slow diffusion rate, it hardly contributes to dust collection. It enables it to correspond to the use to dust collection etc. with this operation gestalt by including the small ion of the process to a large ion in large quantities in air.

[0051] In addition, if the molecule of water is not supplied,  $N_2^+$ ,  $O_2^+$ , etc. adhere to the dust in air etc. However, most small ions stabilized in this case will not be generated, but most will disappear in the phase in the middle of growth (carbonation). Conversely, if it says, discharging in air, by supplying the molecule of water, a lot of stable small ions will be generated, and it will become possible to include this in air.

[0052] - According to the effectiveness-book operation gestalt 1 of the operation gestalt 1, it is a discharge electrode (2). Counterelectrode (3) Since waterdrop is supplied and this waterdrop is electrified, discharging ~~in-between~~, an ion yield can be adjusted by adjusting applied voltage and amount of water. Therefore, stopping the discharge current and amount of water conventionally, it becomes comparatively easy to increase the amount of generating ion, and operation effectiveness improves.

[0053] Moreover, since it becomes easy to generate a lot of ion, the effectiveness in the case of using it for the application of \*\*\*\*\*-proof etc. can be raised to sufficient level.

[0054] Moreover, since he is trying to send out the air containing a lot of ion one by one in the same direction as the dropping direction of waterdrop, a lot of ion can be supplied to a required place, generating ion efficiently.

[0055] Furthermore, ion generator since an ion yield increases (1) It also becomes possible to extend applicability. For example, utilization becomes easy when applying to the dust collector which carries out uptake, electrifying the dust in air besides being electrification neutralization, supply to the interior of a room, etc.

[0056] moreover, discharge electrode (2) since the principle of electrostatic atomization is used with this operation gestalt 1 and waterdrop serves as an electrode in fact it is -- there is also an advantage to which the point of a water pipe (12) does not deteriorate.

[0057] - At the example of modification- drawing 1 of the operation gestalt 1, it is a discharge electrode (2). High voltage power supply (4) About a plus pole, it is a counterelectrode (3). Although a minus pole is connected and he is trying to generate plus ion, it is a discharge electrode (2) conversely. About a minus pole, it is a counterelectrode (3). A plus pole is connected and you may make it generate an anion.

[0058] The generation process of an anion is shown in drawing 3 . In this case, the electron generated by corona discharge adheres to the molecule of water, and except for what grows up to be a large ion in part, the stable anion (small ion) is generated in large quantities, reacting with various matter further contained in air.

[0059] In addition, DC power supply (4) AC power supply is connected instead and you may make it generate both plus ion and an anion. Thus, the air containing the ion of both positive/negative is the case where fine particles are charged for example, in fine-particles transportation, the case where the interior of a room is charged in a clean room, etc., and when electrification approaches a plus side, or approaches a minus side and is not stabilized, it can be used effectively for lowering electrification level.

[0060]

[The gestalt 2 of implementation of invention] Ion generator concerning the operation gestalt 2 of this invention (1) A humidifier (21) is used and it is an air duct (5). Moisture is supplied to inside.

[0061] As shown in drawing 4 , it is this ion generator (1). Needle electrode as a

discharge electrode (2) Annular electrode as a counterelectrode (3) Predetermined spacing is detached in the vertical direction and it is an air duct (5). It is arranged in inside. discharge electrode (2) \*\*\*\* -- high voltage power supply (4) a plus pole connects -- having -- counterelectrode (3) \*\*\*\* -- the minus pole is connected.

[0062] On the other hand, it is an air duct (5). Outside, the humidifier (21) is arranged. This humidifier (21) is equipped with the heater (23) in the water container (22). A heater (23) consists of a heating element (24) prepared in the water container (22), and AC power supply (25), and constitutes a heating means to heat water and to evaporate it. A heating element (24) generates heat with electric resistance, and heats water.

[0063] In this humidifier (21), it is an air duct (5) about a steam. Introductory tubing (26) introduced inside is formed. Introductory tubing (26) is a discharge electrode (2) about a steam. It is constituted so that it may introduce up, and opening of the point is placed upside down. And air duct (5) About the steam which blew off inside, he is a fan (7). Discharge electrode (2) Counterelectrode (3) He is trying to show around in between.

[0064] It sets in the above configuration and is an air duct (5) about a steam. It is a discharge electrode (2) in inside. Introductory tubing introduced up (26), the steam is circulated below -- making -- discharge electrode (2) Counterelectrode (3) Fan (guidance means) (7) who shows around in between from -- It is an air duct (5) about the steam generated by the heating means (23). It introduces inside and is a discharge electrode (2). Counterelectrode (3) A steam installation means to show around in between (7 26) It is constituted. moreover, the heater (23) which is a heating means and the above-mentioned waterdrop installation means (7 26) from -- the waterdrop supply means (20) is constituted.

[0065] - The steam generated in the humidifier (21) passes along introductory tubing (26) by the operation actuation-book operation gestalt, and it is an air duct (5). It is introduced inside and this steam is a fan (7). It flows downward.

[0066] On the other hand, it is a discharge electrode (2). Counterelectrode (3) In between, corona discharge occurs by impressing the high voltage. Therefore, the minimum ion generated here, such as  $N_2^+$  and  $O_2^+$ , adheres to the detailed waterdrop contained in a steam, and waterdrop charges and ionizes. The waterdrop supply means (20) serves as an ionization means to supply components, such as ammonia, as a source material of a small ion, like the operation gestalt 1. Therefore, a lot of small ions stabilized by the ion generated considering the water molecule as a nucleus while the above-mentioned source material reacted are generated, where

this small ion is contained in large quantities in air, it is sent, and it goes.

[0067] - It is possible to heighten effectiveness, such as electrification neutralization, since the air which includes operation effectiveness for a lot of ion with slight height by adjusting applied voltage and amount of water like the operation gestalt 1 is easily generable according to the effectiveness-book operation gestalt 2 of the operation gestalt 2, and it is an ion generator (1). Applicability can also be extended.

[0068] Moreover, ion generator which generates a lot of ion with the easy configuration using a humidifier (21) (1) It is utilizable.

[0069]

[The gestalt 3 of implementation of invention] The operation gestalt 3 of this invention is an air duct (5), as shown in drawing 5 . Inner discharge electrode (2) Counterelectrode (3) Water is sprayed discharging in between and ion is generated.

[0070] At this operation gestalt 3, it is an air duct (5). The water pipe (31) which introduces water is prepared in inside, and the spray nozzle (discharge nozzle) (32) is used at the tip of a water pipe (31) as a waterdrop supply means (30). A water pipe (31) is connected to the water tank which is not illustrated, and the spray nozzle (32) is constituted so that water may be sprayed downward. This waterdrop supply means (30) serves as the ionization means, and he is trying to spray the ammonia of a minute amount etc. with water.

[0071] In a spray nozzle (32), it is a high voltage power supply (4). A plus pole is connected and this spray nozzle (32) is a discharge electrode (2). It is used by carrying out. moreover, spacing predetermined under this spray nozzle (32) -- detaching -- ring-like counterelectrode (3) it arranges -- having -- this counterelectrode (3) \*\*\*\* -- high voltage power supply (4) The minus pole is connected.

[0072] Moreover, although not illustrated, it is an air duct (5). In inside, it is a spray nozzle (32). As a ventilation means to ventilate toward a counterelectrode side from a side, he is a fan (7) (refer to drawing 1 ). It is prepared.

[0073] - operation actuation - this ion generator (1) \*\*\*\* -- while spraying water downward from a spray nozzle (32) -- discharge electrode (2) it is -- a spray nozzle (32) to counterelectrode (3) By going and discharging, waterdrop charges and ionizes according to the electric field by applied voltage.

[0074] Thus, while the generated ion reacts with matter, such as ammonia, and a part grows up to be a large ion, a lot of small ions are sent below with air.

[0075] - Since the air which includes operation effectiveness for a lot of ion with

slight height by adjusting applied voltage and amount of water like the operation gestalten 1 and 2 is easily generable according to the effectiveness-book operation gestalt 3 of the operation gestalt 3, it is possible to heighten effectiveness, such as electrification neutralization, and the applicability of an ion generator (1) can also be extended.

[0076] Moreover, the ion generator which generates a lot of ion with the easy configuration using a spray nozzle (32) is utilizable.

[0077] - For the example shown in modification- drawing 5 of the operation gestalt 3, a spray nozzle (32) is a discharge electrode (2). Although it is the example as which it shall serve, as it is shown in drawing 6 , it is a discharge electrode (2) apart from a spray nozzle (32). You may prepare. At the example of drawing 6 , it is a discharge electrode (2). It is constituted by the needle electrode arranged under the spray nozzle (32), and is a high voltage power supply (4). It connects with the plus pole.

[0078] That is, air duct (5) While the spray nozzle (32) which is prepared at the tip of the water pipe (31) which introduces water into inside, and sprays water downward constitutes a waterdrop supply means (30), it is a discharge electrode (2) near the lower part of a spray nozzle (32). It is arranged. And it is a counterelectrode (3) to the lower part of a discharge electrode (2). It is arranged.

[0079] Other parts are constituted like the example of drawing 5 .

[0080] Thus, when constituted, it is a discharge electrode (2), spraying waterdrop from a spray nozzle (32). Waterdrop charges and ionizes by generating corona discharge. While the generated ion reacts with matter, such as ammonia, like each above-mentioned example and a part grows up to be a large ion, a lot of small ions are sent below with air.

[0081] The air which includes operation effectiveness for a lot of ion with slight height is easily generable by adjusting applied voltage and amount of water also in this case. Therefore, it is possible to heighten effectiveness, such as electrification neutralization, and the applicability of an ion generator can also be extended. Moreover, it is a discharge electrode (2) apart from a spray nozzle (32). Since it uses, it becomes possible to ionize waterdrop efficiently and to raise operation effectiveness rather than the example of drawing 5 .

[0082]

[The gestalt of operation of others of invention] This invention is good also as following configurations about the above-mentioned operation gestalt.

[0083] For example, at each above-mentioned operation gestalt, it is an air duct (5).

Although it goes caudad, waterdrop is sprayed inside and he is trying to pass air from the upper part to a lower part, the flow direction of waterdrop or air can be changed suitably.

[0084] Moreover, although the principle of electrostatic atomization, the humidifier (11), and the spray nozzle (32) are used with each above-mentioned operation gestalt in order to electrify waterdrop, you may make it the configuration discharged and electrified, disuniting water in detailed waterdrop mechanically with a propeller etc., for example.

[0085] moreover, discharge electrode (2) Counterelectrode (3) etc. -- a configuration -- suitably -- modification -- possible -- for example, counterelectrode (3) It is good also as a mesh-like electrode.

[0086] Furthermore, as long as the ion of an amount according to an application is generable, it is not necessary to necessarily supply components, such as ammonia.

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## DESCRIPTION OF DRAWINGS

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### [Brief Description of the Drawings]

[Drawing 1] It is the sectional view showing an operation in the outline structure list of the ion generator concerning the operation gestalt 1 of this invention.

[Drawing 2] It is drawing showing the generation process of plus ion.

[Drawing 3] It is drawing showing the generation process of an anion.

[Drawing 4] It is the sectional view showing an operation in the outline structure list of the ion generator concerning the operation gestalt 2 of this invention.

[Drawing 5] It is the sectional view showing an operation in the outline structure list of the ion generator concerning the operation gestalt 3 of this invention.

[Drawing 6] It is the sectional view showing the modification of the operation gestalt 3.

### [Description of Notations]

- (1) Ion generator
- (2) Discharge electrode
- (3) Counterelectrode
- (4) High voltage power supply
- (5) Air duct
- (6) Blast pipe
- (7) Fan (ventilation means)
- (10) Waterdrop supply means



- (11) Water tank
- (12) Water pipe
- (20) Waterdrop supply means
- (21) Humidifier
- (22) Water container
- (23) Heater (heating means)
- (24) Heating element
- (25) AC power supply
- (26) Introductory tubing (waterdrop installation means)
- (30) Waterdrop supply means
- (31) Water pipe
- (32) Spray nozzle (discharge nozzle)

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